CLAIMS

1. Apparatus for stimulating photoacoustic waves in a region of a body and generating signals responsive to the stimulated photoacoustic waves comprising:

a light source that provides light that stimulates photoacoustic waves in the region;

a light pipe having an output aperture and at least one input aperture, which light pipe receives the light from the light source at the at least one input aperture and transmits the received light to illuminate the region from the output aperture; and

at least one acoustic transducer that generates signals responsive to acoustic energy from the photoacoustic waves that is incident on the optical output aperture.

2. Apparatus according to claim 1 and comprising microprisms formed in the light pipe that reflect the light propagating towards the output aperture so that it exits the light pipe through the output aperture.

3. Apparatus according to claim 1 or claim 2 and comprising a Bragg grating formed in the light pipe that receives light propagating towards the output aperture and directs the received light so that it exits the light pipe from the output aperture.

4. Apparatus according to any of the preceding claims and comprising a holographic lens formed at the output aperture that receives light incident on the output aperture and directs the received light so that it exits the light pipe from the output aperture.

5. Apparatus according to claim 4 wherein the holographic lens configures the exiting light into a light beam having a desired shape.

6. Apparatus according to claim 5 wherein the light beam is configured by the holographic lens into a substantially cylindrical light beam.

7. Apparatus according to claim 6 wherein intensity of light in the light beam is substantially constant over the cross section of the light beam.

8. Apparatus according to claim 6 wherein intensity of light in the light beam varies harmonically over the cross section.

9. Apparatus according to any of the preceding claims and comprising a holographic lens formed at the at least one input aperture that directs light received at the input aperture towards the output aperture.

10. Apparatus according to any of claims 1-9 and comprising a Bragg grating formed in the light pipe that receives light from the input aperture and directs the light towards the output aperture.

11. Apparatus according to any of the preceding claims wherein the light pipe is planar, having relatively large parallel face surfaces and a relatively narrow edge surface.

12. Apparatus according to claim 11 wherein the light received from the light source propagates from the input aperture towards the output aperture along a direction parallel to the plane of the light pipe.

13. Apparatus according to claim 11 or claim 12 wherein an input aperture of the at least one input aperture is located on a face surface of the light pipe.

14. Apparatus according to any of claims 11-13 wherein an input aperture of the at least one input aperture is located on an edge surface of the light pipe.

15. Apparatus according to any of claims 11-14 wherein the at least one transducer comprises at least one transducer mounted on a face surface of the light pipe and wherein acoustic energy incident on the output aperture is incident on the at least one transducer after propagating through the light pipe along a direction substantially perpendicular to the face surfaces.

16. Apparatus according to any of the preceding claims wherein the at least one transducer comprises a Bragg grating formed in the light pipe and a light source that illuminates the Bragg grating and wherein an amount of the illuminating light that exits the Bragg grating is responsive to acoustic energy incident on the output aperture of the light pipe.

17. Apparatus according to any of the preceding claims wherein the at least one transducer comprises a Fabry-Perot interferometer formed in the light pipe and a light source that illuminates the interferometer and wherein an amount of the illuminating light that exits the interferometer is responsive to acoustic energy incident on the output aperture of the light pipe.

18. Apparatus according to any of the preceding claims and comprising input optics controllable to change a direction from which light from the light source is incident on the input aperture.

19. Apparatus according to claim 18 wherein a direction along which light that enters the light pipe from the light source exits the output aperture is responsive to the direction from which the light is incident on the input aperture.

20. Apparatus according to claim 18 or claim 19 wherein the input optics comprises a mirror that receives light from the light source and directs the received light towards the input aperture and the mirror and/or light source is controllable to change the direction from which light is incident on the input aperture.

21. Apparatus according to claim 17 and comprising a controller that controls the position of the mirror and/or the light source.

22. Apparatus according to any of the preceding claims and comprising an optical fiber that transmits the light from the light source to the input aperture.

23. Apparatus according to claim 19 wherein an end of the optical fiber is bonded to an input aperture of the at least one input aperture.